

New Upland Stream Frogs of the *Eleutherodactylus rugulosus* Group (Amphibia: Anura: Leptodactylidae) from Honduras

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Abstract.—A new species of the *Eleutherodactylus rugulosus* group is described from each of two montane sites in the Cordillera de Nombre de Dios and the Cordillera de Celaque of northcentral and southwestern Honduras, respectively. The northern form differs from the wide-ranging *E. rugulosus* in having vocal slits and nuptial pads in adult males (both absent in the latter) and in coloration. The Celaque species has a vocal slit but lacks nuptial pads in the only known adult male and is further distinguished from *E. rugulosus* and the other new form in hand morphology.

Savage (1975) reviewed the characteristics and distribution of the twelve species of Mexican and Central American stream frogs then thought to be allied to *Eleutherodactylus rugulosus*. The name *Eleutherodactylus berkenbuschii* subsequently was revived for *rugulosus*-like populations from Atlantic slope México that shared the following features: karyotype of $2N = 22$, a sharp canthus rostralis, the first finger usually shorter than the second and the dorsum smooth (Savage and DeWeese 1979). Two forms originally included in this complex (Savage 1975), *Eleutherodactylus matudai* and *Eleutherodactylus milesi*, were shown to form a distinct lineage not closely related to the *E. rugulosus* group and were placed in the *E. milesi* group (Miyamoto 1983; Savage 1987). An additional three species (*Eleutherodactylus anatipes*, *E. anomalus*, and *E. zygodactylus*) from the Pacific slope of northwestern South America recently were placed in the *E. rugulosus* group (Savage 1987). With these modifications, the *E. rugulosus* group now contains 14 species and ranges from tropical México, south through Central America to western Colombia and Ecuador.

Recent fieldwork in México, Guatemala, and the mountainous regions of Honduras has produced materials of several previously unknown species referable to the *E. rugulosus* group. In the present paper we describe (definitions of character states follow Savage 1975, 1987) two of these new species from Honduras, the first of them to be called

Eleutherodactylus aurilegulus, sp. nov.

Holotype.—KU 209002, adult male, from Quebrada de Oro (15°38'N, 86°47'W), elevation 780–840 m, tributary of Río Viejo, south slope of Cerro Búfalo, Cordillera de Nombre de Dios, Departamento de Atlántida, Honduras, collected 14

August 1982 by James R. McCranie, Kenneth L. Williams, and Larry David Wilson. Original number LDW 6261.

Paratypes.—KU 209005, 209017–018, 209022, LACM 137293–294, adult males, and KU 209003–044, 209006–016, 209019–021, 209023, LACM 137286–292, 137295, adult females, from the type-locality, 780–1110 m.

Diagnosis.—A species having medium sized adult males (31–45 mm in standard length) and large adult females (60.7–80.5 mm) that is distinctive within the *E. rugulosus* group in having vocal slits and nuptial pads present in adult males, the first finger longer than the second, a rounded canthus rostralis, definite finger and toe disks, basal to moderate toe webbing, a pale yellow venter, and the posterior thigh surface usually blotched or mottled. The only other Mexican or upper Central American member of the group having vocal slits and nuptial pads in adult males is *Eleutherodactylus merendonensis* of northwestern Honduras. *E. aurilegulus* differs from the latter form (which has substantial toe webbing and fringed toes, strongly expanded finger and toe disks and a flap-like inner tarsal fold) in having basal to moderate toe webbing, ridges on the toe margins, much smaller finger and toe disks, and a strong but not flappable inner tarsal fold.

The new species resembles three lower Central American forms, *E. escoces*, *E. fleischmanni*, and *E. punctariolus* in the significant secondary features (presence of vocal slits and nuptial pads). *E. aurilegulus* is distinct from *E. escoces* (features for the latter in parentheses) most notably in coloration in having the venter pale yellow in life (bright red in adults) and the posterior thigh surface blotched, mottled, or spotted with light areas (uniform or suffused). *E. escoces* also has less toe webbing, with around 4½ phalanges free of the web on toe IV (ca. 4 in *aurilegulus*) and slightly smaller finger disks, no more than 1.5 times width of the phalanges (nearly twice width of phalanges in *aurilegulus*). From *E. fleischmanni* the new frog differs primarily in having larger finger and toe disks which are barely expanded in the former species. *E. punctariolus* has strongly expanded finger and toe disks and substantial webbing and fringes on the toes as compared to the smaller disks, basal to moderate toe webbing, and a ridge on toe margins in the new species.

E. aurilegulus is most likely to be confused with *E. rugulosus*, which generally occurs at elevations below 600 m along the Caribbean versant to the north of the Cordillera de Nombre de Dios in Honduras (Fig. 1) and has not been taken on the southern slopes of that range. The latter species is found however, from 500–2000 m in the central highlands of Honduras. *E. rugulosus* lacks vocal slits and nuptial pads in adult males and has the posterior thigh dark chocolate brown with discrete small to moderately large light spots. Adult male *E. aurilegulus* have vocal slits and nuptial pads and most examples of the species have a posterior thigh with a pattern of irregular light blotching and/or mottling. A few specimens have the thigh pale brown or tan with small light spots. In these examples the ground color is not as intense nor are the spots as clearly defined as in *E. rugulosus* from Honduras.

The Nombre de Dios endemic is distinguished from the second new form described in this paper in the diagnosis of the latter in a subsequent part of this account.

Summary of characteristics.—Dorsum granulate; canthus rostralis rounded; tympanum distinct; first finger longer than second; finger disks definite, almost

twice width of digit just proximal to disks on fingers III–IV; strong inner tarsal fold; toe disks definite, at least 1.5 times width of digit on toes III–V; toes with a marginal ridge; toes with definite basal to moderate webbing, modal webbing formula I 2–2½ II 2–3½ III 3–4+ IV 4+–2¾ V; paired vocal slits in adult males; nuptial pads in adult males; venter pale yellow, lightly punctated to heavily spotted with grayish or brown; throat lightly punctated to heavily pigmented with gray, grayish brown, or brown; dorsum pale olive brown to brown, uniform or spotted, some specimens with a thin yellow vertebral line; groin spotted or mottled; posterior surface of thigh usually blotched, or mottled sometimes with very small obscure light spots; underside of tibial segment clear, suffused, or barred; adult males 31–45 mm in standard length, females to 80.5 mm.

Coloration in life.—The coloration of the holotype (KU 209002) was as follows: dorsum pale olive brown with paler spot between shoulders and pale indication of interorbital bar; sides of body pale olive yellow, mottled with pale olive brown; venter pale yellow; throat white, mottled with pale brown and pale yellow; posterior surface of thighs brown, mottled with olive yellow; loreal region and lips pale olive yellow with brown bars; iris gold above, bronze below, separated by golden brown band. Two adult females (KU 209004, LACM 137286) were similar to the holotype except that LACM 137286 had a thin yellow vertebral stripe with the area around the stripe on the snout an ocher color. Another female (KU 209014) was colored as follows: dorsum dirty olive green with scattered rust red spotting; venter pale yellow with scattered gray punctations; throat pale grayish brown with white punctations; posterior surface of thighs brown with pale olive green mottling; upper lips with pale olive green and dark brown markings; soles of hands and feet gray; iris coppery bronze.

Measurements of holotype.—Standard length 44.8 mm; other measurements as percentages of standard length: head length 39.3; head width 38.4; orbit 13.2; snout length 17.9; loreal length 11.6; tympanum height 10.7; hindleg length 173.2; tibia length 58.0.

Measurements of paratypes.—Standard lengths are given in millimeters, other measurements as percentages of standard length (range followed by mean in parentheses). Standard length, 6 adult males 31.2–44.6 (40.7), 25 adult females 60.7–80.5 (68.8); head length, males 40.1–43.3 (41.0), females 38.6–46.9 (42.1); head width, males 36.7–39.1 (38.1), females 37.2–42.3 (39.9); hindleg length, males 171.4–183.4 (177.1), females 166.0–186.2 (175.4); tibia length, males 56.7–60.6 (58.4), females 54.2–61.6 (57.6).

Etymology.—The specific name *aurilegulus* is from the Latin meaning washing or bathing in gold because this species occurs along the margins of a golden stream, the Quebrada de Oro.

Natural history notes.—The vegetation at the type-locality is of the Subtropical Wet Forest formation of Holdridge (1967) and will be described in more detail by McCranie et al. (in prep.). Some members of the type series were collected during the day but were more frequently seen at night, especially during light rains. Specimens were collected in the water at the edges of the Quebrada de Oro, on the ground alongside the stream, and perched on large boulders in the stream. The known elevational range is 780–1110 m.

An adult female (KU 209003) was found on 4 June 1980 in association with a clutch of eggs in a dirt cavity in a crack of a huge flat rock. There are 80 eggs

in the clutch (KU 209034). The eggs were adherent to one another and lacked melanin deposits. Each egg capsule is about 6.5 mm in diameter, the ovum 4.4 mm.

Referred specimens.—Included here are juveniles and subadults from the Quebrada de Oro from between 780 and 1110 m as follows: KU 209024–027, LACM 137297, subadult males, KU 209028–29, 209031, LACM 137296, subadult females, and KU 209030, 209032–033, juveniles.

The second new form is to be known as

Eleutherodactylus anciano, sp. nov.

Holotype.—KU 208999, adult male, from El Chagüitón (14°30'N, 88°48'W), elevation 1830 m, 18.8 km SE Corquín, Cordillera, de Celaque, Departamento de Ocotepeque, Honduras, collected 25 May 1980 by James R. McCranie and Larry David Wilson. Original number LDW 5573.

Paratypes.—Royal Ontario Museum (ROM) 18076–079, adult females, from the type-locality, 1770–1830 m.

Diagnosis.—A species with medium sized adults (33 mm in standard length in a male, 32.8–41.2 in females) that differs from other members of the *E. rugulosus* group in having the following combination of character states: a single dextral vocal slit and no nuptial pads in the adult male; the first finger equal to or shorter than the second; definite finger and toe disks; moderate toe webbing; a pale yellow venter and the posterior thigh surface with discrete and contrasting small light spots on a dark brown field.

The only other Honduran species of *Eleutherodactylus* with which *E. anciano* might be confused is the wide-ranging (México to Panamá) and variable *E. rugulosus*. The new form differs from *E. rugulosus* (characteristics for this species in parentheses) in having a vocal slit in the adult male and finger 1 equal to or shorter than finger 2 (no vocal slits, finger 1 longer than 2). In addition *E. anciano* may be a smaller species than *E. rugulosus* since the latter includes adult males of 26–50 mm in standard length and females attain a size of 91 mm (in the samples of the new frog the only adult male is 33.0 mm in standard length and largest adult female is 41.2 mm, but the available series is small, $\bar{x} = 8$).

Eleutherodactylus anciano and *E. rugulosus* share the distinctive posterior thigh coloration of discrete, vivid light spots on a dark brown background. This pattern is also found in two other members of the *E. rugulosus* group, *E. berckenbuschii* of eastern México, and *E. brocchi* of Caribbean slope Guatemala. The new species resembles *E. berckenbuschii* in usually having finger 1 shorter than finger 2, but the latter lacks vocal slits in males, has a sharp canthus rostralis and the underside of the tibial segment of the leg is banded or boldly marked and suffused with dark pigment (vocal slit in adult male, rounded canthus rostralis, and the underside of the tibial segment barred, in *anciano*).

E. anciano is very different from the brightly colored *E. brocchi* (character states in parentheses) in having a vocal slit in the adult male, finger 1 shorter than finger 2, substantial toe webbing in adults (no vocal slits, finger 1 longer than finger 2, and practically no toe webbing) and in lacking large, light thigh spots, large dark spots on the throat and venter and the bright red coloration of the posterior venter and limb undersurfaces (large, bold light spots on thigh, throat, and venter with large dark spots, and bright red on posterior venter and lower surfaces of limbs).

The El Chagüitón species is not very similar to the other new form, *E. aurilegulus*, described in the present paper from northcentral Honduras and they may be readily distinguished on the basis of thigh pattern (distinct light spots on a dark field in *E. anciano* versus blotched, mottled or with very small, indistinct light areas in *E. aurilegulus*). In addition, *E. aurilegulus* has nuptial pads in adult males (absent in *E. anciano*) and has finger 1 longer than finger 2 (1 equal to or shorter than 2 in *E. anciano*).

Summary of characteristics.—Dorsum smooth to granulate; canthus rostralis rounded; tympanum distinct; first finger shorter than second or rarely equal in length; finger disks definite, almost twice width of digit just proximal to disks on fingers III–IV; strong inner tarsal fold; toe disks definite, at least 1.5 times width of digit on toes III–V; toes with a marginal ridge; toes with definite basal (juveniles) to moderate webbing, modal webbing formula I 2–2½ II 2–3+ III 3–4 IV 4–2½ V; a dextral vocal slit in adult male; no nuptial pads in adult male; venter white to pale yellow, immaculate; throat punctate to heavily pigmented with gray; dorsum olive green, tan, or rust brown, uniform, spotted, or mottled; groin spotted or mottled; posterior surface of thigh with small light spots on dark brown field; underside of tibial segment barred; adult male 33.0 mm in standard length, females to 41.2 mm.

Coloration in life.—The coloration of the four adult female paratypes was as follows: (ROM 18076) dorsum rust brown; venter cream; throat gray with white spots; posterior surface of thighs dark brown with cream spotting; upper surfaces of limbs rust brown with brown bands on legs; iris bronze with black reticulations: (ROM 18077) dorsum mottled dark and pale olive green with salmon pink spotting; venter pale yellow; throat white with gray punctations; posterior surface of thighs dark olive green with pale yellow spotting; iris dark bronze with dark reticulations; soles of hands and feet dark brown. Two other females (ROM 18078–079) were similar to ROM 18077 except that ROM 18078 had a pale olive green interocular bar. The coloration of three subadult males was as follows: (KU 209000) dorsum tan with pale brown mottling; pale brown interorbital bar; venter pearly white; posterior surface of thighs brown with yellow spotting; (KU 209001) dorsum grayish tan with brownish gray markings; sides of head with bronze patina; venter dirty yellow; throat pearly gray; iris bronze: (ROM 18080) dorsum olive green with rust red spotting; discontinuous rust red middorsal stripe; venter pale yellow; throat white with gray punctations; iris bronze with black reticulations; soles of hands and feet dark brown.

Measurements of holotype.—Standard length 33.0 mm; other measurements as percentages of standard length: head length 41.5; head width 40.6; orbit 14.8; snout length 17.9; loreal length 12.1; tympanum height 10.6; hindleg length 175.5; tibia length 59.1.

Measurements of paratypes.—Standard lengths for four adult females are given in millimeters, other measurements as percentages of standard length (range followed by mean in parentheses). Standard length 32.8–41.2 (37.9); head length 38.0–41.3 (40.0); head width 37.3–40.9 (39.3); hindleg length 180.5–197.1 (186.9); tibia length 59.4–62.6 (61.4).

Etymology.—The name *anciano* is an arbitrary combination of letters that happens to mean ancient in Spanish. The name is an allusion to Kenneth L. Williams, who has materially aided McCranie and Wilson in their efforts to

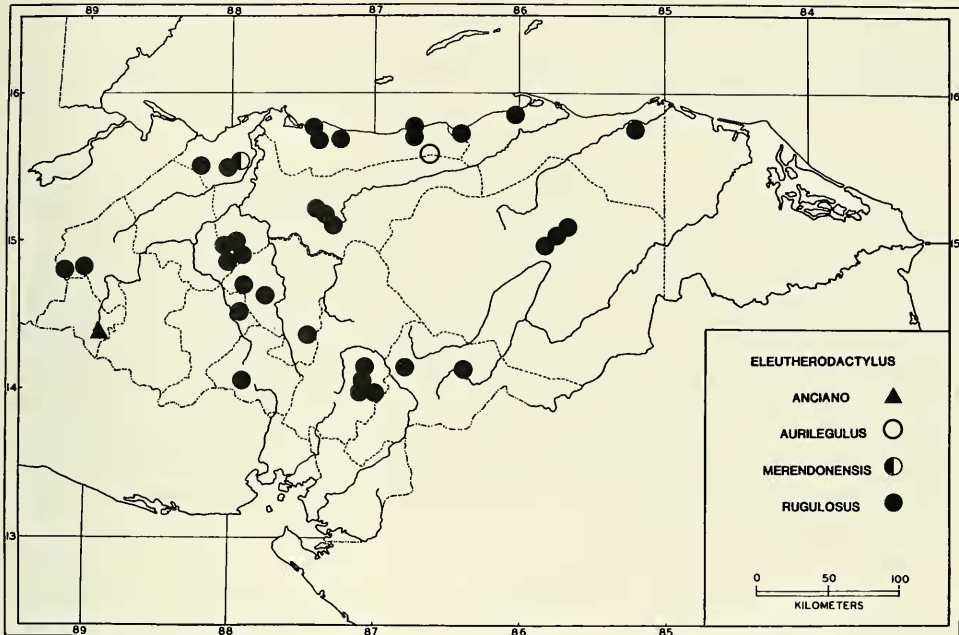


Fig. 1. Distribution of frogs of the *Eleutherodactylus rugulosus* group in Honduras.

elucidate the Honduran herpetofauna and helped in collecting the paratypes, and whose sobriquet is *El anciano*.

Remarks.—The condition of having a single dextral vocal slit as found in the male holotype of this species seems to be an anomaly. Additional material probably will prove that paired vocal slits are typical for the population since this is the condition in other members of the stock when the character is present.

The species is known from a single ridge (1770–1840 m) in the Cordillera de Celaque of southwestern Honduras (Fig. 1), very near to its boundary with El Salvador. Although *E. rugulosus* occurs at upland sites between 600–1370 m to the north in the Sierra Espíritu Santo and from 750–2000 m to the east of this site (Fig. 1), that species has not been collected in the vicinity of the Cordillera de Celaque or the adjacent Cordillera de Opalaca, even at lower elevations. Our decision to describe *E. anciano* involves a prediction that a distinctive allopatric montane population of the *E. rugulosus* group resembling the type series in significant features inhabits the Cordillera de Celaque and possibly the Cordillera de Opalaca as well.

Natural history notes.—All specimens of this species were collected alongside a small stream between two severely deforested hillsides presently used for pasturage. The original vegetation at the type-locality was of the Lower Montane Moist Forest formation of Holdridge (1967). Remnants of this vegetation occur on isolated hilltops in the area. The male holotype and one female paratype were collected during the day, the remaining specimens were found at night along the banks of or on rocks in the stream. The species is uncommon at the type-locality inasmuch as 6 nights of collecting in 3 different years produced only 6 specimens. Other streams in the area that were searched both in the daytime and at night

produced no additional specimens. The known elevational range is 1770–1840 m.

Referred specimens.—KU 20900–001, ROM 18080, subadult males from the type-locality, 1810–1840 m.

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